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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/821,755	04/09/2004	Kevin D. Belfield	UCF-385	3191

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EXAMINER	
ANGEBRANNDT, MARTIN J	

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1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/821,755	BELFIELD, KEVIN D.	
	Examiner	Art Unit	
	Martin J. Angebranndt	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10/22/07 & 10/17/07*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

1. The response of the applicant has been read and given careful consideration. Responses to the arguments are presented after the first rejections to which they are directed. The applicant has been granted a delayed claims for priority. The applicant is accorded the date of the earliest priority document (60/333972) for the claimed invention. The declaration states that the effective date of Fleming et al. WO 01/96959 is 12/20/2001. This is incorrect, this reference was filed after 11/29/2000, is in English and lists the US in the designated states, and further claims priority to an US provisional application. The US provisional application has been reviewed by the examiner and does not discuss leuco dyes. Therefore the date accorded Fleming et al. WO 01/96959 under 102(e) is 06/14/2001. The applicant's declaration under 37 CFR 1.131 has been reviewed. The applicant states that the invention was made 10/2000 (section 7), but the section (5) does not describe the composition beyond it including a polymer and being used in 3D optical storage. There is no mention of a photoacid generator or a reactive dye in section 5. The attachment is a paper received by the journal Chemistry of Materials on 09/18/2001. It is not clear from the record what was portion of the invention was in the possession of the applicant prior to the drafting of this paper. There is not date regarding the drafting of the paper, so the applicant is accorded the date of the signed University of Central Florida Invention Disclosure Form (09/19/2001 in section 16, last page). Should the applicant wish to pursue this path, then documentation of the laboratory work should be provided complete with dates to address the issue of exactly what aspects of the invention was in the possession of the applicant when and when reduction to practice occurred. Based upon the sworn declaration it seems that the earliest date the applicant can claims is 10/2000. The Belfield et al. "Three dimensional two photon

imaging in polymeric materials" Proc. SPIE vol. 4459 pp. 281-289 (01/2002) or the corresponding presentation (July 2001) is not now considered prior art.

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1,3 and 18-19 are rejected under 35 U.S.C. 102(e) as being fully anticipated by Devoe et al. WO 01/96952.

Devoe et al. WO 01/96952 teaches two photon imaging as means for controlling the area of exposure (within focal volume) in three dimensions and the ability to write features below the diffraction limit. The use of a ti:sapphire laser is disclosed. (8/17+). The use of sensitizers to sensitize iodonum and sulfoniumsalts is disclosed. (21/3-16). The use of dye precursor, such as lueco quinine, thiazine, phenazine or triarylmethane dyes is disclosed. (29/11-25). The use of binders is disclosed. (40/19+) Examples 2, teaches a mixture of solution A which contains a diaryl iodonium salt, a leuco dye and a two photon sensitizer with solution C which contains a polymeric binder (cellulose acetate butyrate) which is coated to a thickness of 5 microns in thickness. This is exposed using the Ti:sapphire laser operating at 800 nm which scanning facilitated using the three axis stage and imaging of the layer (AC) to form cyan colored images is disclosed (examples 5 and 6). The use of fluorene sensitizers is disclosed on page 20. the

Ti:sapphire laser is tunable over 700-980 nm. (8/22-24). The fluorescence of the photosensitizers is disclosed page 10+.

Devoe et al. WO 01/96952 is accorded the date of 06/14/2001 as a 102 reference as the priority document 60/211708 does not disclose the cited example. The approximately is held to embrace two or three layers.

4. Claims 1,3 and 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fleming et al. WO 01/96959.

Fleming et al. WO 01/96959 teaches in examples 2 and 3 a photosensitive composition comprising a polystyrene-acrylonitrile binder, diphenyliodonium hexafluorophosphate (a photoacid generator) and bis[4-(diphenylamino)styryl]-1,4-(dimethoxy)benzene (a two photon dye) coated to a thickness of 60 microns written upon using a Ti:sapphire operating at 800 nm with a 100 fs pulsewidth (pages 49-53) to write data in the overlap of approximately 10 microns (48/8). The use of fluorene dyes is disclosed on page 28. The formation of layers as thick as 100 mm is disclosed (8/13)

The document is accorded the date of 06/14/2001 as the priority document 60/211708 does not disclose leuco dyes.

It would have been obvious to one skilled in the art to modify the cited example by adding a leuco dyes as discussed on pages 17-19 with a reasonable expectation of forming a useful colored pattern.

The argument that the applicant does not change the optical properties of the storage medium is without merit as the irradiation clearly changes the chemical composition. Further, the claims do not exclude concurrent polymerization and color change with the

bleaching/degradation of the two photon absorber. The applicant can exclude based upon the teachings of the instant specification. Specifically:

> With the ever-pressing demand for higher storage densities, researchers are pursuing a number of strategies to develop three-dimensional capabilities for optical data storage in organic-based systems. Among the various strategies reported are holographic data storage using photopolymerizable media (Cheben, P. and Calvo, M. Appl. Phys. Lett. 2001, 78, 1490; U.S. Pat. No. 5,289,407 and U.S. Pat. No. 6,310,850), photorefractive polymers (Belfield et al. Field Responsive Polymers, ACS Symposium Series 726, ACS, 1999, Chapter 17), and two-photon induced photochromism (Belfield et al. Organic Photorefractives, Photoreceptors, and Nanocomposites, Proc. SPIE Vol. 4104, 2000, 15 22; U.S. Pat. No. 5,268,862). It is known that fluorescent properties of certain fluorophores may be changed (quenched) upon protonation by photogeneration of acid (Kim et al. Angew. Chem. Int. Ed. 2000, 39, 1780). Belfield et al. J. Phys. Org. Chem. 2000, 13, 837 has reported two-photon induced photoacid generation using onium salts and short pulsed near-IR lasers in the presence of a polymerizable medium, resulting in two-photon photoinitiated cationic polymerization. The inherent three-dimensional features associated with two-photon absorption provides an intriguing basis upon which to combine spatially-resolved, two-photon induced photoacid generation and fluorescence quenching with two-photon fluorescence imaging.

The holographic data is still data. The applicant does not require a scanning exposure for the IR exposure and so the argument that the claims exclude holograms is without merit. The claims language does not preclude additional sensitization from a sensitizer. The examiner holds that the iodonium salt undergoes the two photon absorption of the laser light. The examiner notes that the compounds of the instant specification in figure 8 is known as a multiphoton spectral sensitizer for onium salts as evidenced by the same compound being illustrated on page 20 of Devoe et al. WO 01/96952 and page 28 of Fleming et al. WO 01/96959.

The applicant can address this rejection and that above by showing that the onium salts of Devoe et al. WO 01/96952 or Fleming et al. WO 01/96959 do not undergo two photon absorption at 730 or 800 nm. The examiner notes that the applicant uses 730 nm laser light on page 8 of the instant specification as the IR light. The claims do not require ternary/multichannel recording as there is no description/recitation of this in the claims beyond intended use. Even claim 2 fails to recite the readout at the two fluorescent wavelengths (650 and 530) needed to collect ternary information. Readout at only one or at a wavelength where they overlap will not yield ternary information

5. Claims 1-5,7-12, and 15-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Devoe et al. WO 01/96952 and Marder et al. '913.

Marder et al. '913 teaches the use of binders in two photon absorbing compositions (28/29-53). The use of polymerization processes is also disclosed. (10/12-30)The composition in column 99 include a binder (see also 98/65-99/11). The use of these compositions in writing three dimensional media is taught in column 100. The two photoabsorption maxima for bis{4-diphenylamino)styryl] 1,4-dimethoxybenzene is 733 nm.

It would have been obvious to modify the cited example of Devoe et al. WO 01/96952 by using other laser wavelengths such as 733 nm, in place of the 800 nm used in the invention with a reasonable expectation of forming the desired images with an increased sensitivity based upon the two photoabsorption maxima for bis{4-diphenylamino)styryl] 1,4-dimethoxybenzene taught by Marder et al. '913.

6. Claims 1-5,7-12, and 15-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Devoe et al. WO 01/96952 , in view of Marder et al. '913, Goodman et al. '153 and Rentzepis et al. '610.

Goodman et al. '153 teaches with respect to example 6 a polymeric gel matrix formed which include photocurable species, a fluorescent dye (rhodamine) and a photochromic dye (rose bengal). Successive scanning of the laser resulted in differential crosslinking cased by two photon polymerization. (21/7-38). The exposures used a Ti:sapphire laser (19/10-20). The use of various two photon processes, including those of Hull and Kawata et al. is disclosed. (2/20-50). Goodman et al. '153 teach the use of two photon excitation to cure a polyurethane adhesive, where a single objective is scanned along one direction on a stage capable of X and Y scanning and using a Ti-sapphire laser with 100 fs pulses and a rep rate of 67 MHz to form a line (19/10-53). A similar process is used to polymerize trimethyolpropane trimethacrylate (20/35-52). Figure 18 shows squiggled lines. The use of a 4 Pi excitation to allow the formation of point volumes of less than 250 nm and z (axial) dimensions of less than 100 nm disclosed. The beams are overlapped spatially and temporally and the power levels are adjusted so that excitation occurs from in the overlap area. The ability to form tall of thick features is limited by the working distance of the objective elements, but is useful in the formation of masks, membranes

and sensors which are thin, but have complex patterns (figure 3 and 7/59-8/27). The use of cationic and free radically polymerization means is disclosed, including the use of iodonium salts. (9/25-60). The desirability of forming small two or three dimensional features is described in the abstract and the formation of features having dimensions of less than 50 nm along the X,Y and Z axes is desribed. The use of galvanic scanning is disclosed with respect to figure 2 (feature 27) and figure 20B feature 70.

Rentzepis et al. '610 teach the combination of a 1-nitro-2-naphthaldehyde (NNA) with methylmethacrylate monomer, rhodamine B and azobis-(2-methyl-propionate) which is polymerized to form a cube (14/47-57). The use of other acid generating species with the rhodamine is disclosed. (9/39-44) The use of this in 2P-3D two photon recording is disclosed (9/46+) and the use of photoacid generators such as onium salts in two photon processes is disclosed (10/40-42). The readout using fluorescent measurement is taught with respect to figure 8a and 8b.

It would have been obvious to form a medium with a binder/matrix which includes color forming materials, such as the leuco dyes taught by Devoe et al. WO 01/96952 based upon the use of similar composition by Goodman et al. '153 which uses a matrix, Marder which uses a binder and the cited text of Rentzepis et al. '610 with a reasonable expectation of forming a useful three dimensionally imaged article, noting that WO-9954784 is the WIPO equivalent of Goodman et al. '153 and wo-9821521 is the WIPO equivalent of Marder et al. '913. Further it would have been obvious to modify the process/articles as three dimensional recording media using processes of Rentzepis et al. '610 based upon the direction to these in Marder et al. '913.

The use of fluorine compounds as the two photon absorbers is taught by Devoe et al. WO 01/96952 and Marder et al. '913

7. Claims 1-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over by Devoe et al. WO 01/96952 , in view of Marder et al. '913 Goodman et al. '153 and Rentzepis et al. '610, further in view of Glushko et al. '671 and Fourkas et al. '063.

Glushko et al. '671 teach the formation of fluorescent multilayered optical recording media illustrated in figures 12-18. The formation of "100 or more" layers is specifically disclosed. (9/17-20).

Fourkas et al. '063 teach the variation in the power and duration to control the data bit size. [0025]. The media can be can be doped into a porous medium or coated as a multilayered form with spacers between the layers. [0043]

It would have been obvious to one skilled in the art to modify the two layer embodiment exemplified by Devoe et al. WO 01/96952 form the media rendered obvious by the combination of Devoe et al. WO 01/96952 with Marder et al. '913 Goodman et al. '153 and Rentzepis et al. '610 by adding other layers of to 100 or more with spacers based upon the teaches of Glushko et al. '671 and Flourkas et al. as each layer will increase the information density of the medium.

8. Claims 1-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over by Devoe et al. WO 01/96952, in view of Marder et al. '913 Goodman et al. '153, Rentzepis et al. '610, Glushko et al. '671 and Fourkas et al. '063, further in view of Rentzepis et al. '031 and Tanaka et al. "Rapid sub-diffractin limit laser micro/nano processing in a threshold material system", Appl. Phys. Lett., Vol. 80(2) pp. 312-314 (01/2002).

Rentzepis et al. '031 teach 100 planes of data [0010]. The use of 3D media which are a cube (1 cm^3 or a disk 1.25 cm thick and 8 cm in diameter where plane of data 20 microns thick. [0145] 1.25 cm = 12500 microns. Which yield approximately 312 (20 micron thick) data layers with an equal thickness of material (20 microns) separating these planes.

Tanaka et al. "Rapid sub-diffraction limit laser micro/nano processing in a threshold material system", Appl. Phys. Lett., Vol. 80(2) pp. 312-314 (01/2002) teaches the formation of sub microns features (down to 120 nm) using two photon excitation processes with a Ti:sapphire operating at 780 nm and 150 fs pulsewidth. (page 312). (Note instant specification and prepub at page 10)

To further support the position that submicron features can be written and that more than 300 layers can be formed and that this would have been obvious to one skilled in the art the examiner cites Rentzepis et al. '031 which teaches the formation of planes of data with thickneses of 20 microns and media having thicknesses of 1 cm or 1.25 cm and the teachings of Tanaka et al. "Rapid sub-diffraction limit laser micro/nano processing in a threshold material system", Appl. Phys. Lett., Vol. 80(2) pp. 312-314 (01/2002) which establishes that submicron features can be made/recorded and establishes that the desired variation in bit size taught by Fourkas et al. '063 embraces the 0.576 micron (576 nm) size recited in claim 22 and holds that it would have been obvious to modify the media /processes rendered obvious by the combination of Devoe et al. WO 01/96952, Marder et al. '913 Goodman et al. '153, Rentzepis et al. '610, Glushko et al. '671 and Fourkas et al. '063 by adding further layers and using fine laser spots based upon the teachings withinthe art by Rentzepis et al. '031 and Tanaka et al. "Rapid sub-

diffractin limit laser micro/nano processing in a threshold material system", Appl. Phys. Lett., Vol. 80(2) pp. 312-314 (01/2002).

The applicant bears the burden of showing the unobvious benefit arising from this bit size.

9. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

10. Claims 3-22 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-4 of U.S. Patent No. 7,001,708, in view of Glushko et al. '671 and Fourkas et al. '063.

Claims 1-4 of U.S. Patent No. 7,001,708 recite a fluorene two photon dye, a binder and photoacid generator.

It would have been obvious to one skilled in the art to the invention of claims 1-4 of U.S. Patent No. 7,001,708 by forming multiple recording layers of to 100 or more with spacers based upon the teaches of Glushko et al. '671 and Flourkas et al. as each layer will increase the information density of the medium with a reasonable expectation of success.

The examiner relies upon the basis above to address the issue raised.

11. Claims 1-22 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-15 and 17-21of copending Application No. 11/256552 in view of vol. 4459 pp. 281-289 (01/2002) or the corresponding presentation (July 2001), in view of Glushko et al. '671 and Fourkas et al. '063.

Claims 1-15 and 17-21 of copending Application No. 11/272189 recite a fluorene two photon dye, a binder and photoacid generator and methods of exposure.

It would have been obvious to one skilled in the art to the invention of claims 1-15 and 17-21 of copending Application No. 11/272189 by forming multiple recording layers of to 100 or more with spacers based upon the teaches of Glushko et al. '671 and Flourkas et al. as each layer will increase the information density of the medium with a reasonable expectation of success.

This is a provisional obviousness-type double patenting rejection.

The examiner relies upon the basis above to address the issue raised.

12. Claims 3-22 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-15 and 17-21of copending Application No. 11/272189 in view of Glushko et al. '671 and Fourkas et al. '063.

Claims 6 and 30 of copending Application No. 11/256552 recite a fluorene two photon dye, a binder and photoacid generator.

It would have been obvious to one skilled in the art to the invention of claims 6 and 30 of copending Application No. 11/256552 by forming multiple recording layers of to 100 or more

with spacers based upon the teaches of Glushko et al. '671 and Flourkas et al. as each layer will increase the information density of the medium with a reasonable expectation of success.

This is a provisional obviousness-type double patenting rejection.

The examiner relies upon the basis above to address the issue raised.

13. Claims 3-22 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 29-30 of copending Application No. 11/707553 in view Glushko et al. '671 and Fourkas et al. '063.

Claims 29-30 of copending Application No. 11/707553 recite a fluorene two photon dye, a binder and photoacid generator.

It would have been obvious to one skilled in the art to the invention of claims 29-30 of copending Application No. 11/707553 by forming multiple recording layers of to 100 or more with spacers based upon the teaches of Glushko et al. '671 and Flourkas et al. as each layer will increase the information density of the medium with a reasonable expectation of success.

This is a provisional obviousness-type double patenting rejection.

The examiner relies upon the basis above to address the issue raised.

14. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Martin J. Angebranndt whose telephone number is 571-272-1378. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Martin J Angebranndt/
Primary Examiner, Art Unit 1795

Martin J Angebranndt
Primary Examiner
Art Unit 1756

7/3/2008